REMARKS/ARGUMENTS:

The above-identified patent application has been amended and Applicants respectfully request the Examiner to reconsider and again examine the claims as amended.

Objections

The Examiner objected to the drawings for failure to comply with 37 CFR 1.84(p)(5), because the drawings do not include the reference character "141" mentioned in the specification. This reference character appeared at page 10, line 7 of the specification as filed. Inclusion of this reference character was an inadvertent typographical error. In particular, page 10, line 7, as filed, contained the phrase "Each system memory 114 and 141 is used by . . . ." The addition of the phrase "and 141" was an inadvertent error, and the amendments made herein delete this phrase.

In addition, the Office Action objected to the specification because of an inadvertent error at page 23, line 19, in referring to erroneous use of "AIX" instead of "UX." This error has been corrected as suggested, and Applicants appreciate the Examiner's bringing this error to their attention.

Status of the claims

Claims 28-56 are pending in the application, and all claims stand rejected. Claim 46 was amended to correct a minor typographical error (the first letter of the first word of the claim, "The," was missing the letter "T"). No new matter has been added, and the scope of this claim was not changed. The pending claims are thus claims 28-56, of which claims 28, 45, and 56 are in independent form.

The Rejections Under 35 U.S.C. §102(e)

The Examiner rejects Claims 28-56 under 35 U.S.C. §102(e) as being anticipated by Gusler (U.S. patent number 6,493,729) (hereinafter "Gusler"). Applicants note that the Office Action erroneously listed the patent number for Gusler as being U.S. Patent No. 6,567,811. That patent number corresponds to a patent to Edwards et al. (mentioned on page 9 of the Office

Action as being art of record and not relied upon). Based on the cited passages, Applicants have assumed in this response that the 35 U.S.C. §102(e) rejections are based upon U.S. patent number 6,493,729 to Gusler et al. (as listed on the "Notice of References Cited" that was included with the Office Action).

Rejection of Independent Claim 28 (and all claims dependent therefrom, namely claims 29-44)

Applicants submit that Claim 28 is patentably distinct over Gusler, since the cited reference neither describes nor suggests each and every element of this claim, which requires:

> A method for managing data that may be replicated from one or more volumes of data that are part of a first volume group on a first computer system having a first operating system, the method comprising the computer-executed steps of:
>
> discovering logical information related to the one or more volumes of data that are part of the first volume group on the first computer system and creating a map of the logical information to physical devices on the first computer system;
>
> mounting a duplicate of the one or more volumes of data on a second computer system having a second operating system using the map to create a second volume group that is substantially identical to the first volume group.

In particular, Applicants maintain that Gusler fails to teach or suggest *discovering* logical information related to a volume of data that is part of a first volume group, *creating* a *map* of the logical information to physical devices, and *using the map* to create a second volume group during *mounting of a duplicate* of the one or more volumes of data.

To support an assertion that Gusler teaches each and every element of claim 28, the Examiner cites a passage at col. 13, lines 32-24 of Gusler. The cited passage of Gusler states "*This script will merge two separate AIX filesystems mounted on separate logical volumes into one single filesystem mounted on two mirrored logical volumes.,*" Applicants note that the cited passage apparently refers to part of a script found in FIGS. 8A-8G.

As Applicants' specification and Gusler each clearly explain, there are differences between filesystems, physical volumes, logical volumes, and volume groups. An understanding of these differences helps to clarify why the claims of the instant invention are quite unlike the teachings of Gusler, especially the cited passages. **Physical disks**, such as a first hard disk drive of a personal computer, are formatted into **physical volumes** (see Applicants' specification at page 12, lines 17-19 and also Gusler at FIG. 4A and at the associated description at Gusler col. 9,

lines 28-40). Each **physical volume** is split into discrete chunks called **physical partitions** (see Applicants' specification at page 12, lines 19-20 and Gusler at FIG. 4A and at col. 9, lines 40-46). Physical volumes are combined into a **volume group**, where a volume group is a collection of disks treated as one large storage area (see Applicants' specification at page 12, lines 20-21 and Gusler at FIG. 4A and at col. 9, lines 35-40.). A **logical volume** is a number of physical partitions allocated from a single volume group (see Applicants' specification at page 12, line 21 through page 13, line 1), and although data on logical volumes appears to be continuous to a user, it can actually be discontinuous on the physical volumes in the volume group (see Gusler at FIG. 4A and at col. 9, lines 48-62).

A **file** is a basic unit of storage; for example, in Unix, a file is a sequence of bytes (e.g., 8 bits). A **filesystem** is a structure or collection of files, such as the arrangement of files on physical partitions of a disk or a directory tree (See Applicants' specification at page 13, lines 1-3). For example, in the Unix operating system, the filesystem is a structure defining how files are named, stored, and organized, and the Unix filesystem keeps track of a file's size, location, ownership, creation time, etc. (See Gusler at col. 3, line 18 through col. 4, line 40).

The cited passage in Gusler merely refers to merging separate **filesystems** mounted on separate **logical volumes**. As the definitions and explanation above makes clear, this cited passage does not at all teach claim 28's recitation of "***discovering logical information*** *related to the one or more volumes of data that are part of the first volume group on the first computer system and* ***creating a map*** *of the logical information to physical devices on the first computer system*". As explained in Applicants' specification as filed at page 17, line 20, through page 18, line 15, the map can be used to build a substantially identical logical configuration on the second computer system, and the logical configuration can be used to mount a duplicate of a volume (e.g., a Business Control Volume (BCV)) on the second computer system.

Further, nowhere in Gusler, including the cited passage, is there a teaching of mounting a duplicate of a volume of data to a second computer system, where this mounting is done using the map that was created based on logical information discovered about the volume of data. Nor does Gusler teach using a map to create a second volume group.

The discovery of logical information, creation of a map of the logical information, and creation of a second volume group using the map, as recited in claim 28, provides technical

advantages. For example, as explained in Applicants' specification as filed at page 4, line 20 through page 5, line 6, although it is known to restore source or standard data from replicated copies (e.g., mirrors), it is difficult to have a substitute computer fully take over the role of a failed computer, including having the second computer work with the replicated data in substantially the same manner as the original computer. However, as taught in the embodiments of the present invention, the discovery of logical information, creation of a map, and use of the map provide the ability to get logical information related to a first computer, which can thus enable a *second computer* to take over the role of a failed first computer, including working with replicated data, if needed.

Gusler, by contrast, has no teaching or suggestion, in either the cited passage or elsewhere in the patent, for discovering *logical information* about a first computer, for creating any type of a *map* that maps the logical information to physical devices, or for using the map during *mounting* of duplicate data to create a second volume group. Nor does Gusler mention the creation of any type of map of logical information to physical devices anywhere in its text or Figures. Although FIG. 4A of Gusler shows a general illustration of a relationship between physical volumes, physical devices, and logical volumes for a UNIX based system, Gusler does not teach or propose creation of any type of a map of any portion of this relationship, or of any relationship between logical information and physical devices. Further, Gusler has no teaching that it would be advantageous or desirable to have or use such a map, or the information contained in the map, during Gusler's described processes for splitting and/or merging mirrored filesystems.

In sharp contrast, the map recited in claim 28 provides *the ability to build a substantially identical logical configuration on the second computer system* (see claim 28 and also Applicants' specification as filed at page 18, lines 2-5). This can be very advantageous in situations where data in the volumes is associated with an application such as a database (see Applicants' specification as filed at page 18, lines 12-15), because, as those skilled in the art know, databases often include unformatted," raw" or "binary" filesystems and/or data. The map can provide the ability to decipher such raw filesystems and/or data. Gusler does not teach creation or use of such a map and does not need to, because Gusler is limited to use with formatted filesystems,

such as the filesystems associated with UNIX file system (see Gusler at col. 3, line 28 through col. 6, line 8).

Further, the cited passage of Gusler refers to mounting a filesystem to two *mirrored* logical volumes, not mounting a volume to a second computer system; that is, the cited passage of Gusler describes an operation at the filesystem level, not the logical volume level. In contrast, claim 28 provides a method that operates at the **volume group and logical volume** levels, to effectively "rebuild" a volume group on a second computer system, where the volume group on the second computer system is a duplicate of a volume group on a first computer system.

Gusler itself differentiates between logical volumes and filesystems, noting that "logical volumes are an additional level of abstraction from the filesystems" (col. 10, lines 44-45) and that "the present invention [Gusler's] allows for splitting and merging to occur at the **filesystem** level rather than the logical volume level" (col. 10, lines 63-65) [emphasis added]. Gusler thus recognizes that logical volumes are not the same thing as filesystems. This, together with the definitions and explanations above, further differentiates claim 28 over Gusler.

The cited passage of Gusler also does not teach or suggest creating a second volume group that is substantially identical to a first volume group, as recited in claim 28. Again, the passage in Gusler instead describes creating a filesystem, not a volume group. Filesystems are not the same thing as volume groups.

Applicants submit that the script referred to in the cited passage does not teach the invention as recited in claim 28. Instead, the script instead appears to perform a process that is quite different from the recitation of claim 28. The script of FIGs. 8A-8G (referred to in the sentence immediately preceding the cited passage) appears to be for merging two separate filesystems into a single filesystem, and lists the following actions in its comment lines:

Test for valid existing primary and secondary filesystems
Test that the first filesystem is not at maximum mirrored copies
Test that second filesystem is not mirrored
Test that the logical volumes are the same size
Test for a secondary logical volume on multiple disks
Unmount the secondary filesystem
Delete the secondary filesystem in preparation for the merge
Test for successful filesystem delete
Perform the merge
Test for Successful Merge

The above script fails to teach or even to describe any of the elements of claim 28, as amended. Instead, the above script refers to making various checks to ensure that two filesystems can be merged into a single filesystem, and then performing the merge. This merging occurs at the filesystem level. Applicants respectfully submit that the process described by Gusler is irrelevant to claim 28.

In addition, the above script states that Gusler will "Test for valid existing primary and **secondary** filesystems [emphasis added]". This line in the script assumes that *a secondary filesystem already **exists***. In contrast, claim 28 does not presume or require that a secondary (e.g., second) volume group, logical volume, or even filesystem is present on the second computer system - - instead, claim 28 recites that a map is used to create the second volume group.

Still another difference between claim 28 and Gusler is the fact that claim 28 requires that logical information can be discovered related to one or more volumes of data that are part of a first computer system **having a first operating system**, and that a duplicate of the one or more volumes of data can be mounted on a second computer system **having a second operating system**. The first and second operating systems could be the same (see claim 29), but claim 28 itself does not require the first and second operating systems to be the same - the first and second operating systems could, in fact, be different. More particularly, claim 28 requires discovering logical information and creating a map that can be used to decipher the mounted duplicated data volume(s) on the second computer system. In contrast, because Gusler is merging or splitting at the filesystem level, Gusler cannot work with first and second operating systems that could be different. That is, Gusler is limited to a single operating system.

For at least the above reasons, it is not seen how this passage in Gusler, or the script referenced by it could possibly be viewed as teaching the invention as claimed. In view of the above, Applicants submit that Claim 28 is patentably distinct over Gusler.

Claims 29 to 44 depend from and thus include the limitations of Claim 28. Thus, Applicants submit that Claims 28 to 44 are patentably distinct over the cited reference for at least the reasons discussed above in conjunction with Claim 28. Applicants thus respectfully request that the rejection of claims 28 through 44 under 35 USC 102(e) be withdrawn.

Rejection of independent claim 45 (and all claims dependent therefrom, namely claims 46-55)

The Office Action states that "claims 45-55 have similar limitations as claims 28-38. Therefore, they are rejected under Gusler for the same reason [sic] set forth in the rejection of claims 28-38." Accordingly, Applicants repeat the arguments made above in connection with claims 28-38 in their contention that claim 45 and all claims dependent therefrom, namely claims 46-55, are patentable over Gusler for at least the reasons discussed above in connection with claims 28-38. Applicants thus respectfully request that the rejection of claims 45 through 55 under 35 USC 102(e) be withdrawn.

Rejection of independent claim 56

The Office Action states that Gusler teaches each and every limitation of claim 56 and cites various passages and Figures of Gusler in support of this assertion. Claim 56, reads:

> A program product for use with a data storage system having a plurality of storage devices and which is in communication a first and second computer system, the program product being for management of data and being comprised of:
>
> computer-executable logic contained on a computer-readable medium and which is configured for causing the following computer-executed steps to occur:
>
> establishing one or more mirrored copies of data that are copies of one or more volumes of data that are part of a first volume group on a first computer system having a first operating system;
>
> separating the one or more mirrored copies of data from the respective one more volumes of data;
>
> discovering logical information related to the one or more volumes of data that are part of the volume group on the first computer system and creating a map of the logical information to physical devices on the first computer system;

> mounting a duplicate of the one or more mirrored copies of data on a second computer system having a second operating system and using the map to create a second volume group that is substantially identical to the first volume group.

Claim 56 contains two limitations that were also recited in claim 28, namely:

> discovering logical information related to the one or more volumes of data that are part of the volume group on the first computer system and creating a map of the logical information to physical devices on the first computer system;
>
> mounting a duplicate of the one or more mirrored copies of data on a second computer system having a second operating system and using the map to create a second volume group that is substantially identical to the first volume group.

Applicants have already discussed the patentability of these limitations over Gusler in connection with the discussion above for claim 28. Applicants repeat those arguments here.

The Office Action contends that Gusler contains additional grounds for rejection of these limitations, and Applicants briefly address these grounds below.

First, the Office Action cites FIG. 4A, FIG. 7G, and col. 9, lines 30-32 as teaching claim 28's recitation of "*discovering logical information related to the one or more volumes of data that are part of the volume group on the first computer system and creating a map of the logical information to physical devices on the first computer system*". Applicants earlier pointed out (in the arguments for claim 28) that a FIG. 4A is merely general illustration of a relationship between physical volumes, physical devices, and logical volumes for a UNIX based system, and that Gusler does not teach or suggest creation of a map of any portion of this relationship, or of any relationship between logical information and physical devices. Moreover, providing such a general illustration, such as FIG. 4A, does not teach or suggest computer executed steps of discovery of logical information related to a volume of data on a first computer system and creating a map of the logical information to physical devices on the first computer system.

Col. 9, lines 30-32 of Gusler, which are also cited, merely refers descriptively to FIG. 4A and recites "*FIG. 4A illustrates the relationship among physical volumes, physical devices, and logical volumes within a volume group.*" Note that the sentence immediately preceding the cited passage begins the same paragraph and reads "*Before discussing the present application, a*

cursory *discussion of a volume group in a UNIX based system might be helpful*" (Gusler at col. 9, lines 29-29) [emphasis added]. The cited passage, when taken in context, merely refers to a general illustration of relationships. Applicants fail to understand how these two sentences can be viewed as teaching or suggesting the computer-executed steps of discovering logical information related to volumes of data in a volume group on a computer system and creating a map of the logical information to physical devices on the computer system.

Regarding FIG. 7G of Gusler, FIG. 7G is one page of a so-called "mirror split" script. It is unclear to Applicants where or how this portion of the script teaches claim 28's recitation of discovering logical information related to one or more volumes of data that are part of a volume group on a first computer system and/or claim 28's recitation of creating a map of the logical information to physical devices on the first computer system. The script in FIG. 7G lists the following actions in its comment lines:

> Test for invalid number of remaining copies
> Test for non-strict mirroring (PV's does not match mirror count)
> Test for invalid disks
> Test for FS on proper disk
> Perform split

Nowhere does this script describe anything about discovering logical information associated with volumes of data and creating a map based on that (or based on anything else). Rather, Gusler's script in FIG. 7G is part of an overall script (corresponding to the flowchart of FIG. 5) that assumes a mirror exists, then splits the mirror from the original at the filesystem level (see Gusler at col. 10, line 48 through col. 13, line 29). This is quite different from claim 28, which mounts a duplicate volume and uses the map to actually create a second volume group. Mounting a duplicate and creating a volume group is not the same thing as splitting a mirrored filesystem that already exists.

Next, the Office Action cites FIG. 4B and col. 13, lines 31-33 of Gusler, as teaching claim 56's recitation of *"mounting a duplicate of the one or more mirrored copies of data on a second computer system having a second operating system and using the map to create a second volume group that is substantially identical to the first volume group.*" First, FIG. 4B, like FIG. 4A, is merely an illustration depicting a volume group that includes mirrors, for a UNIX based

system (see Gusler at col. 9, lines 28-29 and col. 10, line 1). Gusler does not teach or suggest creation of a map of any portion of the relationship of FIG. 4B, or of any relationship between logical information and physical devices. Moreover, providing such a general illustration, such as FIG. 4B, does not teach or suggest computer executed steps of mounting a duplicate of the one or more mirrored copies of data on a second computer system having a second operating system and using the map to create a second volume group that is substantially identical to the first volume group.

Regarding col. 13, lines 31-33, this passage, when read in context (i.e., from line 30 to line 35) reads "*FIGs. 8A-8H depict a filesystem merge script representing an exemplary embodiment of the present invention. The script is called "merge-fs-copy.ksh" This script will merge two separate AIX filesystems mounted on separate logical volumes into one single filesystem mounted on two mirrored logical volumes.*" The Office Action already cited a portion of this passage in the rejection of claim 28, and Applicants earlier addressed both this passage and the script referred to therein, in connection with their arguments for the patentability of this same limitation, in connection with claim 28. Applicants thus repeat herein the arguments made previously.

For at least the above reasons, Applicants respectfully submit that independent claim 56 is patentable over Gusler. Applicants thus respectfully request that the rejection of claim 56 under 35 USC 102(e) be withdrawn.,

In view of the above amendment and remarks, Applicants submit that Claims 28-56 and the entire case are in condition for allowance and should be sent to issue and such action is respectfully requested.

The Examiner is respectfully invited to telephone the undersigning attorney if there are any questions regarding this Amendment or this application.

The Assistant Commissioner is hereby authorized to charge payment of any additional fees associated with this communication or credit any overpayment to Deposit Account No. 500845.

Respectfully submitted,

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DALY, CROWLEY & MOFFORD, LLP

By: _____

Paul D. Durkee
Reg. No. 41,003
Attorney for Applicant(s)
275 Turnpike Street, Suite 101
Canton, MA 02021-2354
Tel.: (781) 401-9988, ext. 21
Fax: (781) 401-9966

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